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# SIGMA XI QUARTERLY

Vol. VIII SEPTEMBER, 1920 No. 3

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University of Pennsylvania, Philadelphia, Pa.

Secretary.....HENRY BALDWIN WARD
University of Illinois, Urbana, Illinois

Treasurer.....GEORGE R. PEGRAM

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Floyd Karker Richtmyer Edwin Emery Slosson

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Floyd Karker Richtmyer  Edwin Emery Slosson
Henry Baldwin Ward

VOL. VIII  SEPTEMBER, 1920  NO. 3

## EDITORIALS

**The attention of chapter officers is called to the fact that all matters which are to be presented to the Convention should be outlined in advance so that chapters and delegates may know of the topics needing attention and consider in advance their relation to the welfare of the organization. The December number of the QUARTERLY is especially designated by the Editorial Committee for the publication of articles bearing upon such questions as will be considered at the Convention. In view of printing conditions it is necessary to ask that material for this number be sent to the Secretary as early in October as possible.**

In connection with the accounts of the installation of the three new chapters which have been added to the roll of Sigma Xi, members of the Society are given in the following pages brief statements concerning the institutions at which these chapters have been located. The questions addressed to the Executive Committee at the time of the Convention and since then have seemed to indicate a desire on the part of the membership for some specific information concerning the relation of these institutions to research, and the sketches printed answer those questions in a manner that demonstrates the right of the new chapters to take their place among the strong institutions already in membership in the organization.

Some six years ago at the Philadelphia Convention, December 28, 1914, the Society granted a charter for an alumni chapter in the District of Columbia, recognizing fully the importance of the National Capital as a center for research activity and a source of stimulation for investigation that made its influence felt over the

length and breadth of the nation and even beyond those limits. While the organization of this chapter and its influence upon research have very naturally been interfered with by conditions existing during the War so that new plans must very likely be laid to give it a proper place and work, yet despite all difficulties and trials it is bound to be a great center of research influence. This is all the more true by virtue of the magnificent growth of the National Research Council and the wide extension of its influence throughout the country. It is more than a little fortunate for Sigma Xi that its present President should be at this time one of the leaders in the development of the movement fostered by the National Research Council. The Sigma Xi Society has been from the start closely in touch with the Council as well as immediately responsive to the opportunities afforded by its organization. It will be recalled that at the Convention in New York City on December 27, 1916, President Charles S. Howe read a communication from Dr. G. E. Hale, Chairman of the National Research Council, requesting the cooperation of the Society of the Sigma Xi in organizing the research activities of the country. By unanimous vote the Executive Committee was authorized to exert its influence and lend the support of the Society to this movement. The significance of the request and the propriety of the most intimate relations between the National Research Council and the Sigma Xi Society were commented on by Professor Richtmyer in an editorial published in the QUARTERLY for March, 1917, and again in the June number.

At its meeting in May, 1917, the Executive Committee voted to lend its active support in every way to the Research Council and to place all the machinery of the Society and its publications at the disposal of the National Research Council. While the exigencies of the war period limited the extent to which this proffered cooperation could actually be utilized, yet the general sentiment of the Society was undoubtedly of service in a small way at least in building up public sentiment favorable to the Council. Under present conditions there is larger opportunity for active and definite cooperation, and this end will be eagerly sought by all members of the Society insofar as Sigma Xi can be of specific assistance in the research program.

The second alumni chapter to be established is that at the Mayo Foundation for Medical Education and Research. A brief account

of the institution and of the installation of the new chapter is given in the following pages. Here it may be appropriate to note that the Mayo Foundation represents an entirely new type of organization. Wholly devoted to the extension of knowledge, it has at its disposal funds large enough to make its investigations of pre-eminent significance. Organized under the egis of a great state university, it is assured of freedom from the control of special interests and a stability for the future that could not be accorded to any private undertaking. Definitely circumscribed in the lines of investigation that are to be developed, and yet attacking these with a breadth that is assured by the association of scientific men in a variety of fields of pure and applied science, it gives promise of yielding results for the benefit of the human race beyond those that have been realized by previous undertakings in this field. It is appropriate that the Society of the Sigma Xi should be associated at this early period with the work of the Foundation. It will aid in preserving that breadth of treatment that is inseparable from results of the most fundamental and permanent character. On the other hand the Society will receive through the working of a center exclusively devoted to research a stimulation that will act upon other chapters where varied interests necessarily limit the attention given to investigation and retard the progress of research movements.

# THE MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH

## Historical Sketch

The Mayo Foundation for Medical Education and Research is an endowed department of the Graduate School of the University of Minnesota. Its purposes are indicated in its title. It was founded and endowed by Dr. William J. Mayo and Dr. Charles H. Mayo. It was incorporated February 9, 1915, and became a part of the University of Minnesota, June 9, 1915. The original endowment fund was $1,500,000 which is being added to annually by the interest accruing thereon, the funds for the support of the work at present being provided by Dr. William J. Mayo and Dr. Charles H. Mayo.

The work of the Foundation is an organized outgrowth of the internships, residencies, and assistantships of the Mayo Clinic. The Mayo Clinic had its origin in the work of Dr. William Worrell Mayo and his two sons, William J. and Charles H. From about 1884 to about 1895 this group of physicians was engaged in a general practice which rapidly became more and more limited to surgery. About 1895 their work had become largely diagnostic and surgical, their patients being cared for in St. Mary's Hospital, which is owned and controlled by the Sisters of St. Francis. Interns and residents in St. Mary's Hospital were under the direction of these physicians in the ordinary manner. Some of them were afterward taken on as assistants in the physicians' offices which were used for diagnosis.

In 1905 a definite policy for the development of laboratories was begun. In these laboratories medical graduates were taken on as assistants for one or two years and were then made hospital interns or assistants in medicine or surgery. This plan gradually shaped itself until in 1912 definite three-year courses in pathology, clinical medicine, and surgery were instituted for graduates in medicine.

The development of the graduate work in medicine in the Mayo Clinic had reached such a state by 1914 that at the suggestion of President George C. Vincent of the State University steps were taken by the University authorities to make the work a part of the medical education of the University of Minnesota. In order to

safeguard the interests of the state and to stabilize the work at Rochester the Mayo Foundation was then founded and endowed.

The graduate work in medicine in the Medical School of the University and in the Mayo Foundation is a part of the work in the general Graduate School in the University. Its management is entrusted by the Board of Regents to a Committee consisting of the President of the University, the Dean of the Graduate School, the Dean of the Medical School, and the Director of the Mayo Foundation, ex-officio, together with three other members of the faculty of the Medical School and three other members of the faculty of the Mayo Foundation appointed by the Board of Regents.

The graduate medical educational work in the Mayo Foundation is planned to provide opportunities for graduates of Class A medical schools who have had at least one year of internship or laboratory training, after graduation, to fit themselves for the practice of medicine in some special field, or to become investigators or teachers of medicine. Work is laid out along the lines ordinarily followed by candidates for advanced degrees (M.S. and Ph.D.) in other departments of the University.

In clinical branches students are scheduled for work which brings them in contact with patients approximately but half their time; the remainder of the period is devoted to careful laboratory and literary study in their special fields. The educational resources are adequate laboratory, museum, clinical and library facilities, and a well qualified faculty whose members act as advisors and critics but not as pedagogues in the formal sense. There are no classes. No short term "cramming" courses are offered. Lectures on which attendance is voluntary are given only by men who are authorities in their particular fields.

Every effort is made to impress the graduate student with the fact that his residence is an opportunity for him to find out things for himself and not a period in which he will be didactically instructed by undergraduate methods.

A confidential report on each graduate student is made to the Director by his advisor each quarter. On the basis of these confidential reports and a final conference the graduate student may be recommended as a worthy candidate to take the final examinations and present and defend a thesis, on the success of which he may be recommended to the Board of Regents as worthy of an advanced

degree. The degree of M.S. in a clinical subject indicates high professional proficiency in that field. The degree of Ph.D. indicates high professional proficiency plus the demonstrated ability to do research work of real scientific merit.

All graduate students are Fellows in the Mayo Foundation and as such, if they are majoring in clinical branches, receive stipends of $600, $750, and $1,000 a year for the first, second, and third years respectively. Fellows majoring in fundamental branches receive $900, $1,200, and $1,500 for the first, second, and third years respectively.

Students who do not evince strong personal initiative are not recommended for annual reappointment or may be asked to resign their Fellowships before the end of their current year. In the arrangement of work the best opportunities are consistently given to the best qualified men; mediocre men are not permitted to continue filling opportunities to the exclusion of high grade men.

Twenty-seven advanced degrees have been granted since 191[illegible]. Twenty-three of these are masters' degrees and four are doctors' degrees. At present there are 142 graduate medical students in the Mayo Foundation. This is nearly the capacity of the Foundation. During the last year and one-half about 1,500 applications for Fellowships have been received. From these sixty Fellows have been appointed.

The research work of the Mayo Foundation is conducted personally by or under the direct supervision of members of the faculty whose whole time is spent in the Foundation, or part of whose time is in the Foundation and part in the Mayo Clinic. The subjects of research cover a wide field. Those on the pathology, biochemistry and physiology of the thyroid, on the bacteriology of various infectious diseases, on the physiology of shock, on physiology of the suprarenals, and the liver, on the pathology and biochemistry of malignant tumors, on fluoroscopy, on cardiagraphy, on basal metabolism, and on surgical technic, may be mentioned.

LOUIS B. WILSON, *Director*

## THE MAYO FOUNDATION ALUMNI CHAPTER

For several years there have been a number of members of Sigma Xi in the Mayo Foundation and Mayo Clinic. From time to time one of these members would mention the fact that there

were enough men to have an organization of some sort, but it was not until December, 1919, that a group was finally formed into a temporary organization with the idea of carrying out, to some degree, the principles of Sigma Xi.

A preliminary meeting was held December 3, 1919. A committee was appointed and at frequent intervals thereafter during the month, meetings were held and finally resolutions were drawn up making a working basis for the temporary organization. We determined to have informal meetings for the discussion of things purely scientific, avoiding as much as possible anything pertaining to Medicine, and also to endeavor, as soon as could be arranged, that our organization become recognized by the National Organization in accordance with the constitution of Sigma Xi. The matter was presented before the National Convention on December 26, 1919, in the form of a petition with fourteen names representing eleven different institutions.

A meeting was held January 6, 1920, at which time Doctor T. B. Magath reported enthusiastically on what he had heard at the National Convention and gave us great hope that our petition would be granted.

Another meeting was held January 20th at which time Doctor E. C. Kendall gave us some interesting facts of modern chemistry, particularly emphasizing the opportunity of American chemists that had developed during the war.

February 17, 1920, another meeting was held at which time Dr. Magath talked on his experiences at the Biological Laboratory of the United States Bureau of Fisheries at Fairport, Iowa.

At a meeting held March 16th, the general topic of conversation was on colloids, the discussion being preceded by an interesting talk on the subject by Doctor Kendall.

All of these meetings were very informal, the men meeting at the Clinic lunchroom where a cafeteria supper was served. It was arranged, however, that the group should eat together in a secluded nook, where matters of common interest might be discussed freely. After these informal suppers, an hour was spent in scientific discussions in one of the laboratory rooms of the Mayo Clinic building.

We had heard in the meantime favorably from the University of Minnesota as to their desire to initiate the eight men whose names had been proposed for membership, and also that at their

regular election our Mr. Osterberg had been elected to membership in the University of Minnesota Chapter.

May 21, 1920, the University of Minnesota Chapter sent to Rochester as representatives Dean R. W. Thatcher, President, Doctor R. N. Chapman, Dean L. W. Jones and Doctor C. J. V. Pettibone to initiate these newly elected members of Sigma Xi. The meeting was held in the Assembly room of the Mayo Clinic building at 4:30 p. m. The temporary organization was called to order by Doctor Sanford. Dean Thatcher was introduced and he immediately called to order a special meeting of the Minnesota Chapter of Sigma Xi. The usual initiation ceremonies then followed, the men initiated being:

William James Mayo, M.D.
Charles Horace Mayo, M.D.
Henry Stanley Plummer, M.D.
Edward Starr Judd, M.D.
William Carpenter MacCarty, M.D.
Edward Carl Rosenow, M.D.
Henry William Woltmann, M.D.
Donald Church Balfour, M.D.
A. E. Osterberg.

After the initiation ceremonies the meeting was called to order for the purpose of installation of the Mayo Foundation Alumni Chapter of Sigma Xi by Doctor Julius Stieglitz, retiring President of the National Society of Sigma Xi. All the men present were installed as charter members of the new Alumni Chapter. In addition to the names of the new initiates mentioned above, there were also installed:

Dr. Alfred Washington Adson (Nebraska)
Dr. Harry Herman Bowing (Pennsylvania)
Dr. Nat Hawkins Copenhaver (Yale)
Dr. William DePrez Inlow (Chicago)
Dr. Edwin Calvin Kendall (Columbia)
Dr. James Robert McVay (Missouri)
Dr. Thomas Byrd Magath (Illinois)
Dr. James Albert Hughes Magoun, Jr. (Pennsylvania)
Dr. Frank Charles Mann (Indiana)
Dr. Arthur Hawley Sanford (Northwestern)
Dr. John Hinchman Stokes (Michigan)
Dr. Joseph Peter Weyrens (Minnesota)
Dr. Russel Morse Wilder (Chicago)
Dr. Louis Blanchard Wilson (Minnesota)

Doctor Henry B. Ward, University of Illinois, National Secretary of Sigma Xi, assisted in the installation ceremonies.

Doctor Stieglitz gave an inspiring address on what research means for a country and expressed the hope that scientific men would continue the work so admirably begun during the war by the construction and creation of greater things for the betterment of mankind, particularly along medical lines.

He pointed out that while at first man was in an adoptive state, he later entered a state of adaptiveness, and now he has definitely begun a period of creative science. Nature is not all-wise after all, and the scientific mind can find loop-holes for improvement; instead of accepting conditions as they are, science is beginning to step ahead of nature in an attempt to create. He made special reference to the work of Doctor Mayo in surgery and Professor Kendall in the production of thyroxin and stated that he believed the future belongs to the creative scientist. At the close of his address a beautifully engrossed Charter for the new chapter was presented with his very best wishes for its future.

At 6:30 o'clock at the Zumbro Hotel a banquet was served for the members and guests. During the meal, impromptu speeches were made by Dean R. W. Thatcher, Doctors Julius Stieglitz, W. J. Mayo, L. B. Wilson, and Dean L. W. Jones of the University of Minnesota.

At 8:00 o'clock a most interesting lecture was given by Dr. Henry W. Ward, entitled *On the Trail of the Pacific Salmon*. By way of introduction he pointed out that the ruthless fishing of the salmon had made the genus almost unknown in the East. Professor Ward stated that the present method of fishing salmon would surely drain all the Northwest and Alaskan streams of the fish which in 1919 brought the salmon canneries $50,000,000 and which to the scientist are of interest because of their habits and homing instinct. Lantern slide illustrations portraying the difficulties and beauties of his recent trips along the Alaskan coast line were shown. This experiment was undertaken in order to learn the truth of the fisherman's tale that the full grown salmon from the ocean returns north for spawning to the same stream and exact spot where it was hatched a few years before. Doctor Ward's studies have led him to believe that the salmon's homing instinct is guided by a sense of temperature which always leads it to select

the cooler of two branching streams, and brings it to waters of a temperature suitable for the spawning nests.

The newly installed Mayo Foundation Alumni Chapter of Sigma Xi is to have its first regular meeting in the fall for election of officers and to make plans for the coming year. We are glad to notice that, since our installation meeting, there have been added to our staff more men wearing the Sigma Xi key. We anticipate a prosperous year. The old committee is now working on a plan for a "scientific picnic" which, if it materializes, will be held before our regular fall meeting.

A. H. SANFORD, *President*

# THE UNIVERSITY OF NORTH CAROLINA

## Historical Sketch

The University of North Carolina is the oldest of State Universities in point of service, having opened its doors in 1795. Its first president, Joseph Caldwell, was at first professor of mathematics, and science was at all times of absorbing interest to him. He was commissioner for North Carolina in running the boundary line with South Carolina besides doing important work in locating railways and a proposed canal. Under his presidency the State authorized in 1822 a geological and mineralogical survey which was placed in charge of the University. Professor Olmsted, who afterwards returned to Yale and later became State Geologist of New York published what was probably the first report issued by any state survey. The second report was published by Dr. Elisha Mitchell.

In 1824 Caldwell sailed for England to purchase books and instruments for the University. Among these were a number of astronomical instruments which were first used for instruction and observation on a platform erected upon the roof of the president's house. In 1830 a small observatory was erected in which classes were instructed and many observations on celestial phenomena made. The records of these observations were lost and the instruments scattered and broken up during the occupation and reconstruction period. So far as known this was the earliest observatory connected with an educational institution. Caldwell and Mitchell published text books for their classes and the latter contributed scientific articles to Silliman's Journal. Mitchell continued, unaided by the State, his surveys and investigation of the resources of the State. Among other things he measured the height of the peak named for him, Mt. Mitchell, which is the highest peak east of the Rockies. He lost his life in his last ascent of this peak.

Probably the most distinguished scientific investigator in the first seventy-five years of the University's activity was Nicholas M. Hentz who became an authority upon spiders, publishing a book on the spiders of the United States in addition to a considerable number of papers in various journals.

With the coming of the civil war the activities of the University were reduced to a minimum. Out of fourteen members of the faculty who volunteered seven gave up their lives and out of its list of alumni who were capable of bearing arms about one-third were killed. From 1867 to 1878 its doors were practically closed except for a semi-high school kept up by the reconstruction administration. During the last three or four years of this period there being no faculty and no students the doors were left open to wind and weather and any chance marauder.

The re-opening in 1875 was undertaken chiefly on hope and faith. The State had no funds. Its whole system of education which stood high in the middle of the century, had been practically destroyed. Friends and alumni raised $20,000 for repairs and equipment. It was little short of a tragedy. But a splendid fight was made and with the passing years the victory has been won without outside aid. The University had been declared bankrupt by the courts and such property as remained taken away from it except a homestead consisting of its buildings and the immediately surrounding acres. In 1875 it began with an income of about $10,000 which has grown to a half-million, and its real property is valued at a million and a half besides an endowment approaching two millions. Less than $100,000 has been contributed by other than North Carolinians. Its student roll has grown more than fifteen-fold and its faculty shows a similar increase.

The first faculty after the re-opening was made up of young men. President Battle was a far-seeing man and began building anew the school system by establishing the first summer school for teachers in the country. The early graduates went out as missionaries in the cause of education to every nook and corner of the state. For two of these pioneers statues have been erected in the grounds of the State Capitol by a grateful people. Doctor Battle was also deeply interested in science and devoted what funds he could get to develop this side of the University work.

In 1883 four young professors, whose combined age was less than a century, met and decided that the old scientific spirit must be restored and fostered. To this end the Elisha Mitchell Scientific Society was founded and its first thin volume issued in 1884. No financial aid could be extended to it by the University for a number

of years but its Journal steadily appeared with increasingly valuable contributions; first one annual number, then semi-annually and at last quarterly. Thirty-five volumes have appeared comprising nearly 10,000 pages. The contributions have come chiefly from the faculty and students of the University. The boyish spirit of adventure and trust in the future was shown by the young group of four dubbing themselves "Hump, Rump, Mike and the Blank." The Blank died a tragic death a few years later. Rump, meaning Count Rumford, became the first Director of the U. S. Bureau of Mines and was better known as Dr. Joseph A. Holmes. Mike, a name which meant no lack of respect for the great Faraday, was Phillips who became State Geologist for Texas and then President of the Colorado School of Mines. These three have passed to the Great Beyond. The only one now living is the writer of this article who dared assume, with some camouflage, the name of Sir Humphrey Davy.

It is difficult to estimate the influence upon the University of this society with its monthly public meetings. The spirit of investigation penetrated all departments and later historical, philological and educational Journals appeared, all of which have taken a recognized place in their distinctive fields.

The poverty of the University made it difficult sometimes to hold its professors but at least it had the benefit of their services for a time. Among those who went to other institutions were George F. Atkinson, who did much fine work in botany and entomology and then left for Cornell. Dolly in the midst of his investigations on shock was called to the University of Missouri and W. H. Brown was taken by the Rockefeller Institute to continue his pathological work. Baskerville after ten years of fine work went to the College of the City of New York and Herty, whose work was an inspiration to his students, became editor of the *Journal of Industrial and Engineering Chemistry*.

It is interesting to note that in recent years two members of the faculty of the University of North Carolina have been elected to the presidency of the American Chemical Society and one to the presidency of the American Zoological Society. Twelve of them have been placed on the starred list of American Men of Science.

FRANCIS PRESTON VENABLE

## Installation of the North Carolina Chapter

The installation of the chapter of the Sigma Xi at the University was held at the home of Dr. Joseph Hyde Pratt in Chapel Hill, N. C., on the evening of May 26, 1920. At this meeting the following were present:

Clarence E. McClung, President of the Society of the Sigma Xi
Joseph Hyde Pratt (Yale)
James Munsie Bell (Cornell)
Francis Preston Venable
Henry Van Peters Wilson
William DeBerniere MacNider
William Chambers Coker
Alvin Sawyer Wheeler.

As senior member of the local group, Doctor Pratt called the meeting to order. He welcomed President McClung to Chapel Hill and expressed the regret of the chapter-to-be at the inability of Secretary Ward to accept the invitation to participate in the installation ceremonies. The stimulus of Sigma Xi at other institutions would be felt also at the University of North Carolina, which holds a leading position among Southern Institutions for its productiveness in scientific research.

A brief history of the circumstances connected with the petition for the chapter was then recounted by Doctor Bell. Several years ago the four members of Sigma Xi at Chapel Hill met to consider the advisability and the prospect of petitioning for a charter. The four members were:

Joseph Hyde Pratt (Yale)
James Munsie Bell (Cornell)
Robert Lane James (Cornell)
Vivian LeRoy Chrisler (Nebraska).

There was unanimity that the petition should be asked for. It was decided to invite seven other members of the faculty to join in the petition for the chapter, an invitation which all seven heartily approved. The seven were:

Francis Preston Venable
William Cain
Henry VanPeters Wilson
Charles Holmes Herty

William DeBerniere MacNider
William Chambers Coker
Alvin Sawyer Wheeler.

Of the original eleven petitioners three had since left the University: R. L. James, V. L. Chrisler and Charles H. Herty who is now editor of the *Journal of Industrial and Engineering Chemistry*.

Before presenting the charter, President McClung briefly addressed the novitiates on the history and purpose of the Society. The criteria for membership and for associate membership were explained to the new chapter. The delay in granting the charter was due to the constitutional amendment regarding associate membership. Fortunately the settlement of the amendment opened the way for the granting of new charters, the first of which was that to the University of North Carolina. President McClung "pleaded guilty to his first offense" in installing a chapter and spoke of the excellent prospect for an active chapter in the South.

The Society's pledge was then administered by the President to the co-petitioners, Doctors Venable, Wilson, MacNider, Coker and Wheeler. With Dr. McClung as teller, officers of the new chapter were elected:

President—Joseph Hyde Pratt
Secretary—James Munsie Bell.

Further organization of the chapter was postponed to a later meeting and the initiation of Professor Cain who was detained by illness was completed later by signing the constitution.

The chapter having been organized, President McClung formally delivered the charter to the president of the chapter. Doctor Pratt expressed the thanks of the members of the chapter to President McClung for his active interest and for his good wishes for the success of the new organization.

The society was then entertained at dinner by Doctor Pratt.

On Tuesday evening, May 25, Doctor McClung addressed the Elisha Mitchell Scientific Society on the subject Material Basis of Heredity. In introducing him to the society, Dr. H. V. Wilson said that of all the investigators in science only a few arrived at a great truth, one which marked a distinct advance. Doctor McClung was one of the few fortunate ones who had so contributed, his sub-

ject being heredity especially in its relation to the determination of sex. Beginning with the fundamental statement that growth takes place by cell division, it was shown that in some way the characters of the offspring are related to the constitution of the cells from which the individual sprang. The cell structure was then described, with emphasis of course on the nucleus and its content. The characteristics of the chromosomes, their number, size and general physical relations led to the conclusion that these in some way were connected with the character of the offspring. Thus, for certain grasshoppers the female cell contains 12 pairs of such chromosomes before division or 12 single chromosomes after cell division; while the male cell contains 11 pairs of such chromosomes and a single one besides. After cell division two different cells result, one with 11 and one with 12 chromosomes. Fertilization of a female cell of 12 units by a male cell of 11 units produces a male individual; while fertilization of a female cell of 12 units by a male cell of 12 units produces a female individual. This is only one instance where the operation of Mendel's Law is given a mechanical explanation. It is obvious that other characters of the offspring might be connected with the individual chromosomes. Work has been done on that line and much more is in progress.

Dr. McClung's lecture was listened to with great interest by a large audience. After the lecture Doctor Coker entertained the Society at a smoker. It is needless to add that the after-meeting was the occasion of much further discussion on the topic of heredity.

The Elisha Mitchell Society has had a continued and active existence since 1883 when it was founded largely through the efforts of the late Dr. Joseph A. Holmes, who later became director of the Bureau of Mines, of the late Professor Joshua Gore, and of Dr. Francis P. Venable, its first president and now one of the charter members of the Sigma Xi chapter at the University of North Carolina. During all this period monthly meetings have been held, the programs consisting of reports of research work done by University professors or students, and of topics of general scientific interest. The Journal of the Society, also published since 1883, is largely the record of the scientific work of the University. It is now issued quarterly and for a number of years has been edited by Dr. W. C. Coker. The meetings of the society and the publication of the Journal have served greatly as stimuli in scientific investigation.

The newly installed chapter held its second meeting on Monday evening, May 31, at the home of Dr. Joseph H. Pratt. The following were elected to membership in the society:

JOHN FREDERICK DASHIELL *Associate Professor of Psychology*

Children's Sense of Harmonies in Colors and Tones. Jour. Exp. Psychol. Dec., 1917. A Multiple Unit System of Maze Construction. Psychol. Bull., July, 1919. Complete vs. Alternate Methods of Learning Two Habits. Psychol. Rev., March, 1920. Experimental Analysis of the Maze Problem. Jour. of Psychobiology. Proof read. Presented before American Psychological Association.

THOMAS FELIX HICKERSON

*Associate Professor of Civil Engineering*

Formulas for Investment Calculations. Jour. Elisha Mitchell Sci. Soc. Culverts and Small Bridges for North Carolina Highways. (In collaboration with C. R. Thomas.) Econ. Paper #28, N. Carolina Geol. and Econ. Survey. Considerations Governing the Proper Location of Roads. Econ. Paper #43, N. Car. Geol. and Econ. Survey. A New Field Method for Locating Circular Curves by Deflections from the P. I. Eng. and Contracting Mag., June 2, 1920. Tables published in pamphlet form by the author.

WILLIAM FREDERICK PROUTY *Professor of Stratigraphic Geology*

Roads and Road Materials of Alabama. Bul. Ala. Geol. Survey, 11, 1911. Crystalline Marbles of Alabama. Bul. Geol. Soc. 27:437-450 (1916). Meso-Silurian Deposits of Maryland, Am. Jour. Sci., (1918) 26:563-574. The Coosa Coal Fields of Alabama. E&M. Jour. Nov. 6, 1919. Crystalline Graphites of Alabama. Mineral Index, Eng. and Min. Jour. 1918, 1919, 1920; and others.

The following graduate students were elected to associate membership:

| | |
|---|---|
| TROY MUNROE ANDREWS, M.S. | *Chemistry* |
| JOHN NATHANIEL COUCH, A.B. | *Botany* |
| ISAAC VILAS GILES, B.S. | *Chemistry* |
| BLACKWELL MARKHAM, A.M. | *Zoology* |
| SAMUEL CLEMENT SMITH, A.B. | *Chemistry* |
| IRA WELLBORN SMITHEY, M.S. | *Chemistry* |
| JASPER LEONIDAS STUCKEY, A.B. | *Geology* |
| HENRY ROLAND TOTTEN, A.M. | *Botany* |

JAMES M. BELL, *Secretary*

# THE UNIVERSITY OF NORTH DAKOTA

## Historical Sketch

A brief survey of the work done by the University and the outlook for future research in it may not be amiss. In a relatively new community, as in North Dakota, emphasis has naturally been laid primarily on development of the state's resources. To this end the State Geological Survey, established in 1895, in cooperation with the U. S. Geological Survey, has been studying the coal, clay, cement and water resources of the state, as a result of which lignite beds covering an area of more than 30,000 square miles have been located, as well as extensive deposits of clay and cement. The Survey has already published six reports on the topography, geology and mineral resources of the state, while a seventh dealing with the underground waters is in preparation.

The utilization of these resources has been made possible through the work of the State School of Mines, located at the University, and its sub-station at Hebron, working in conjunction with the engineering school of the university. Valuable methods of utilization of lignite, the manufacture of briquets and the use of gaseous by-products has been developed, largely as a result of which the U. S. Bureau of Mines is establishing a large briquetting plant in North Dakota as an experiment, which if successful will be later turned over to private management for operation. The possibility of the manufacture of high grade pottery and fire clay from North Dakota clays has been demonstrated through these researches. Recognition of the work of the head of the School of Mines, Dean E. J. Babcock, was accorded by his appointment during the war as the North Dakota representative of the industrial Preparedness Committee, as a member of the Advisory Committee for North Dakota of the Federal Fuel Administration, as well as to other posts of executive responsibility.

Extensive studies of the surface waters and drainage areas of North Dakota and Minnesota have been made by Prof. E. F. Chandler, head of the Department of Civil Engineering in the University, acting as Assistant Engineer of the U. S. Geological Survey.

The State Public Health Laboratory is a department of the University, and in conjunction with the U. S. Public Health Service conducts a survey of sanitary conditions throughout the state.

An important adjunct of the University is the Biological Station at Devils Lake, established in 1909 for the study of the aquatic resources of North Dakota. As a result of its studies a series of papers have been published on the plants and animals of North Dakota in relation to their environment, and several others are now in press or preparation. In this study it has cooperated with the U. S. Biological Survey and the Museum of Zoology of the University of Michigan, as well as with specialists in many other institutions. The extensive researches on wireless telegraphy conducted at the University by Dr. A. H. Taylor, formerly Professor of Physics, led to his call from the U. S. Navy Department, during the war to take charge of the radio work on the Great Lakes, and later that of the Atlantic Coast.

But while the main trend of science at the University has been economic, pure science has not been neglected. An account of work done or in progress in this field would be impossible in so brief a compass, but as an example of the recognition accorded to this work may be mentioned the grant of money by the American Academy of Arts and Sciences to Dr. B. J. Spence, formerly Head of the Physics Department, for his investigation of infra-red spectra and optical pyrometry, and of similar assistance by the Missouri Botanical Garden to Dr. N. E. Pfeiffer, Assistant Professor of Botany, for a monograph of the genus Isoetes. Graduates in science of the University have been recognized by the other universities of the county such as Yale, Princeton and the University of California, as worthy of fellowship appointments, and many of these graduates are now occupying important posts in industrial and academic life.

The University maintains a Quarterly Journal, devoting one issue yearly to the physical and natural sciences, wherein is recorded the work of members of its staff as well as of those from other institutions. An exchange professorship with the University of Manitoba affords opportunity for an exchange of thought in scientific and other lines, between the University and its sister institution in Canada. Largely through the activity of members of the University there was organized several years ago the State Academy of Science, whose annual meetings afford opportunity for scientific association

among members of the various institutions in the state; while the local faculty maintains a Science Club, at whose monthly meetings the work of the various members is discussed.

### Installation of the North Dakota Chapter

Application for a Sigma Xi charter at the University of North Dakota was made to the Executive Committee in 1916, but the ensuing war with the consequent unsettled conditions delayed action at that time and it was deemed desirable to submit a supplementary petition in 1919. This petition received favorable consideration from the committee and upon its recommendation the general convention of the society held in St. Louis, December 30, 1919, voted unanimously to grant a charter to the petitioners at the University of North Dakota with the provision that undergraduates be elected to associate membership only.

The chapter was organized with the following persons as charter members:

Benjamin Junior Clawson (Kansas) *Professor of Pathology*
Leonard Percy Dove (Northwestern) *Instructor in Geology*
Raymond Royce Hitchcock (Northwestern)
*Professor of Mathematics*
David Rhys Jenkins (Colorado)
*Professor of Electrical Engineering*
Ernest Frederick Peterson (Colorado) *Instructor in Engineering*
Norma Etta Pfeifer (Chicago) *Assistant Professor of Botany*
Bartholomew John Spence (Illinois) *Professor of Physics*
John Welhoff Todd (Columbia)
*Associate Professor of Psychology*
Harry Clyde Trimble (Chicago) *Assistant Professor of Chemistry*
Robert Thompson Young (Nebraska) *Professor of Zoology*

Robert Thompson Young was elected president, Bartholomew John Spence vice-president, and Benjamin Junior Clawson secretary and treasurer.

The installation ceremonies occurred on June 3, 1920. Dean Lauder W. Jones, of the Engineering School of the University of Minnesota, acting as the installing officer. In his installation of the new chapter, Dean Jones pointed out the ideals and opportunities of the man of science in the following happy remarks:

"The establishment of a chapter of Sigma Xi in any university is an event of the first magnitude in the history of that institution. For, on such an occasion those who have dedicated themselves singly to the high ideals of scholarship and research in the various fields of science, consent to bind themselves jointly by the noble pledges of Sigma Xi in order that they may secure mutual cooperation as Companions in Zealous Research.

"I take it that you, as alumni members, have had opportunity in the past to enjoy the privileges which companionship in Sigma Xi affords; and that you welcome this occasion and rejoice that here, in North Dakota, a new chapter is about to be installed through which you may once more renew your pledges to the high ideals of associated scholarship which this event is intended to promote.

"Those who are familiar with the history of Sigma Xi, know that from its very inception this Society has demanded of its initiates recognition of all the essential ideals which every true scholar is bound to consider fundamental. The first printed constitution contains a beautiful passage, which places in bold relief a prerequisite for brotherhood in Sigma Xi, not usually enumerated when the qualifications for membership are summed up, possibly because among men of science this particular quality is taken for granted as a primitive basis upon which any true companionship in research must rest. Permit me to read a few sentences from this remarkable passage.

" 'Friendship in Science . . . . . While those whose heart and soul are in their work are coping with the great problems of nature, let them remember that the ties of friendship cannot be investigated but only felt. Let them join heart and hand, forming a brotherhood in science and engineering, thus promoting and encouraging by those strong personal attachments of friendship the highest and truest advances in the scientific field.'

"To the uninitiated who are prone to regard the man of science as a recluse, so absorbed in the pursuit of his chosen problems that he cares but little for relationships which do not contain elements closely akin to his investigations, this declaration of principles will seem to present a striking contrast. But we, men of science, know full well that the old realm of science in which our early predecessors worked, at all times threatened by a hostile world about them where superstition and bigotry compelled the investigator to conceal rather

than to reveal his discoveries, has passed forever. In the world today men of science in all quarters of the globe are firmly knit together by their common interests, and all men with the eagerness of children about to enjoy a holiday await the announcement of new discoveries accomplished by research.

"This intimate comradeship in scientific research has resulted in a request from investigators in foreign lands for the establishment of chapters of Sigma Xi in their own countries in order that they may share with us in America the associations which this entails.

"As a member of the Executive Committee of Sigma Xi it was my fortune to be chosen to represent the National Society on the occasion of this day. I esteem it an honor to come to North Dakota, the nearest neighbor which the University of Minnesota has in the family of universities, with the duty of installing a chapter of Sigma Xi among you. The University of North Dakota is to be congratulated; for you, as members of its faculty, each with some special province in which contributions to science have been made, represent here an essential part of the living soul of this University, just as men engaged in research must do in every university.

"Let me charge you to proclaim the importance of your tasks. This must be done with no uncertain voice in a state university such as yours and mine; for, even in these days, there are men in high places who believe that it is not necessarily the function of a state to provide funds with which a state university may encourage and promote research in pure science. The aphorism of Michael Faraday which asserts that 'there is nothing so prolific of utilities as abstractions' has no meaning to such men. They classify research into two divisions, profitable and unprofitable, and insist that the state would spend its money foolishly, if they invested it in any form of research which could not show an immediate profit upon the investment.

"One of the hopeful signs of the times in the United States today is to be found in the fact that on all hands men in every walk of life are beginning to realize the interdependence of research of whatever character it may be, whether pure or applied, so-called profitable or unprofitable. For, on many occasions they have been base metal transmuted into gold. An insignificant fact recorded by 'pure' research on the pages of some massive tome, in fine print as a foot-note if you please, has suddenly sprung into prominence like

a newborn star, and the morning papers have recorded this change in bold headlines across their pages; one day it was an obscure fact, worthless except to a specialist, the next day millions of people chattered about it and it filled the entire horizon with its brilliancy.

"The state of North Dakota, like that of Minnesota, is young as compared with many other states of the Union. This great Northwest is within a few hours' journey of the North Country where adventure may still be found, where there are primitive forests, streams rarely traversed by man and wild game in plenty. Our students, therefore, represent a sturdy group of young men and young women, many of them direct descendants of pioneers in this region. It will be your duty to guide many of these students who come under your charge so that a zeal for science and for its advancement may cause them to choose some one of its fields to which they may devote their energies. Sigma Xi has always emphasized the importance of establishing close relations with young students who may show an aptitude for science. Young men and young women of promise while they are still undergraduates should be encouraged by you to become associate members of Sigma Xi so that from their number a group of graduate students may be developed. The charter which I am to present to you today makes it possible for you to put a plan of this kind into operation here.

"I have been informed that Professor R. T. Young has been selected by you to be the first president of the North Dakota chapter. It is a very great pleasure to me to hand him the charter of your new chapter and at the same time to express to you my most sincere congratulations, coupled with the conviction that on the campus of North Dakota you will lay the foundations of a structure which some day will be more highly prized by the citizens of this State than any glorious memorial which they may erect with brick or stone."

Responding on behalf of the new chapter the president replied: "Dean Jones,

As president of the North Dakota chapter of Sigma Xi it is both an honor and a pleasure for me to accept from you the charter which has been granted to us. We accept this honor with a full realization also of the responsibilities which devolve upon us to maintain the standards of the society at the University of North Dakota. We are living in the midst of wonderful opportunities for fruitful research, some of which we have already grasped but many more are

yet awaiting us. As a nucleus of a group of companions in zealous research, we accept this recognition as a call to higher service.

"On behalf of my comrades and in the name of the University, I thank you."

Following the installation, initiation of the following newly elected members was held:

FROM THE FACULTY

EARL JAY BABCOCK, B.S., Sc.D. *Dean of the College of Engineering*

Development of the clay and coal of North Dakota. Publication in bulletins of the North Dakota Geol. Survey and School of Mines, the U. S. Bur. of Mines, etc.

ARTHUR DERMOTT BUSH, B.S., M.D.
*Professor of Physiology and Pharmacology*

Tobacco smoking and mental efficiency. N. Y. Med. Jour. Several articles on perfusion of the isolated medulla of the turtle, Jour. of Pharmacology.

FRANCIS ELWYN CHANDLER, B.A., M.A.
*Professor of Civil Engineering*

Water Resources of North Dakota. Publications in reports of State Engineer and State Geologist, Water Supply Papers of U. S. Geol. Survey, Trans. Am. Soc. Civ. Eng., etc.

ARTHUR GRAY LEONARD, B.A., M.A., Ph.D. *Professor of Geology*

Geology of North Dakota, especially clay and coal. Publications in reports of State Geologist, U. S. Geol. Survey, Bull. Geol. Soc. Am. etc.

AS ASSOCIATE MEMBERS

FRANZO HAZLETT CRAWFORD, S.B. *Physics*

WILLIAM FREDERICK KEYE, B.S., M.S. *Mining Engineering*

Coal and betterment in its uses. Thesis.

PAUL T. NERHUS, B.S., M.S. *Chemistry*

Salts of Devil's Lake Water. Thesis.

HAROLD AKER NOBLE, B.S. *Civil Engineering*

OTTO SANDVIK, B.S. *Physics*

The exercises were followed by a banquet attended by the members and their ladies, with Dean Jones and President Kane as guests of honor. The president of the society acted as toastmaster, and

toasts were responded to by Dean Jones, who spoke of the need of productive research in the life of the university, and President Kane, who pointed out the relation between original investigation and stimulating teaching. Responses on behalf of the new members were given by Dean Babcock and Mr. Keye, and a word of welcome was expressed by Dr. N. E. Pfeiffer for the charter members.

The convocation exercises of the University the following day were in charge of the chapter with the president presiding. At this meeting Dean Jones gave an address on Science and Industry, in which he called attention to some of the contributions of science to our economic life.

R. T. YOUNG, *President*

# CHAPTER REPORTS

## THE OHIO CHAPTER

During the year 1919-20 the chapter held two business meetings and five scientific meetings, two of which were open to the public. The addresses for the year were as follows: On January 21, 1920, reports of the trend of research in the various fields of science as indicated by the papers presented at the scientific meetings during the holiday recess at St. Louis. Mo., by faculty members of the various departments of science on the campus. March 11, 1920, Mt. Katmai and the Valley of Ten Thousand Smokes, by Professor Robt. F. Griggs, of the Department of Botany. April 3, 1920, Some Aspects of the New Universe, by Dr. L. A. Bauer, Director of the Department of Research in Terrestrial Magnetism, Carnegie Institution of Washington, D. C. May 29, 1920, The Growth of Scientific Knowledge as Illustrated in the History of Medical Science, by Dr. George Neil Stewart, Director of the H. K. Cushing Laboratory of Experimental Medicine, Western Reserve University, Cleveland, Ohio. June 3, 1920, The Aims and Purposes of the National Research Council, by Dr. C. E. Mendenhall, Chairman of the Division of Physics of the National Research Council.

The chapter shows increased activity since war times both in the number of addresses given and in the larger number of new members elected. The active members for the year numbered 118 and 63 new members were added in the May election. The names and basis of election of the new members follow:

UNDERGRADUATES

RALPH DANIEL BAKER — *Chemical Engineering*

Plans, Specifications and Operation of the Sulphuric Acid Plant of the Farmer's Fertilizer Company of Columbus, Ohio. Thesis.

JULIUS BOSWAY — *Electrical Engineering*

Alternator Regulation; a Comparative Study of the Different Methods of Calculating Alternator Regulation. Thesis.

COLIN ALFRED CAMPBELL — *Civil Engineering*

Report Upon the Capacity of the Fishinger Bridge Over the Scioto River. Thesis.

EDWIN NELSON COLE COOLIDGE — *Chemistry*

Joint author, A Rapid Method for the Determination of Sulphur in Rubber Compounds. India Rubber Work, March, 1920. The Action of Certain Organic Accelerators in the Vulcanization of Rubber. Jour. Ind. and Eng. Chemistry, 12:1920.

GEORGE FREDERICK DRUM — *Electrical Engineering*

Commutation: A Study of the Effect of Interpole Shape on Commutation. Thesis.

SAMUEL BYRON FOLK — *Civil Engineering*

A Flood Relief Project for Marion County, Ohio. Thesis.

JOSEPH SCOTT GREGORIUS — *General Engineering*

Special Cases of Devitrification and Glass "Stones" Found in Glass Batches.

CARL EUGENE GRESSLE — *Horticulture*

The Efficiency of Various Sprays in Weed Control.

ALBERT THEODORE HAAG — *Horticulture*

The Proper Method of Cutting Roses for Flower Production.

OTTO HINDERER — *Electrical Engineering*

Commutation: A Study of the Effect of Interpole Shape on Commutation. Thesis.

LAWRENCE LESTER HUBER — *Zoology*

A Study of a Chalcid Parasite.

PHILIP ROSEMAND LOWRY — *Zoology*

Methods of Fumigating Against Mealy Bugs. Revision of the Genus Phenacoccus.

MABEL MARIE MADDEN — *Mathematics*

Functions Having Preassigned Zeros and Infinitives.

HAROLD THEODORE RUFF — *Chemical Engineering*

A Study of Carbohydrate Adhesives. Thesis.

VIRGIL EDWIN SCHULER — *Civil Engineering*

Microscopic Investigation of Concrete and Determination of Proportions in Made Concrete. Thesis.

PAUL BURGESS SHAWEN — *General Engineering*

Investigation of Stresses in New York Central Railroad West Bridge No. 6, Western Division. Thesis.

ROBERT BRUNING SHERMAN — *Civil Engineering*

A New Passenger Terminal for Columbus, Ohio. Thesis.

FILLMORE DOWEL SWAN — *Mechanical Engineering*
Static Tests of Dirigible Airship Models.

ARTHUR DRUMMOND SWINGLE — *Horticulture*
Blossom End Rot of Tomatoes in Greenhouse Production.

LOUIS EDMOND VANDEGRIFT — *Civil Engineering*
Determination of Stress Distribution in the Town Street Bridge, Columbus, Ohio. Thesis.

WALTER V. BALDUF, B.A. — *Zoology and Entomology*
Insects Affecting the Soy Bean. Thesis for M.S.

HERBERT LAWRENCE DOZIER, M.S. — *Zoology and Entomology*
Annotated List of Gainsville, Florida Coleoptera, Entom. News, vol. 29. Platycotis Vittata, Ohio Jour. Sci.

MERLE L. DUNDON, B.S. — *Chemistry*
Determination of Solubility Curves by the Method of Floating Equilibrium. Thesis for M.S.

KENNETH JAMES DURANT, B.A. — *Chemistry*
Production of Synthetic Camphor. Thesis for M.S.

RACHEL EDGAR, B.A., and B.S. — *Agricultural Chemistry*
The Effect of High Temperature on the Nutritive Value of Foods, Especially as Concerns the Vitamines or Accessory Substances. Thesis for M.S.

EDWIN ALLEN ESPER, B.A. — *Psychology*
A Contribution to the Experimental Study of Analogy. Thesis for M.A. Psyc. Rev., 25:468-487, 1918.

ELDRA WADE HARTLY, B.A. — *Psychology*
The Correlation of Speed and Accuracy as Shown by the Examination of 500 Army Alpha Examinations. Thesis for M.A.

ORA LORING HOOVER, M.S. — *Chemistry*
The Study of a Method for Determining Selenium in Organic Compounds. Thesis for M.S.

CLOYD DELSON LOOKER, B.S. — *Chemistry*
The Influence of Alkali on the Formation of Vinyl Alcohol from Acetaldehyde. Thesis for M.S.

CLARE S. MARTIN, B.S. — *Chemistry*
Coal Tar Pitch Utilization in Paint. Thesis for M.S.

ELLIS LEO NOBLE, B.A. — *Psychology*
Intelligence Ratings of a Selected Group According to the Army Alpha Test. The Thurston Engineering Test and the Army Alpha Test.

GORDON DERBY PATTERSON, B.S. *Chemistry*

A Study of the Iodine Determination of $SO_2$ in Smelter Fumes. Thesis for M.S.

JOEL BIGELOW PETERSON, B.S. *Chemistry*

A Study of Cracking Petroleum by Catalysis. Thesis for M.S.

YING LAM PUN, B.A. *Chemistry*

Hydrogenation of Cottonseed Oil. Thesis for M.S.

BRYAN AUGUSTUS RICE, B. Cer. Eng. *Ceramic Engineering*

The Development of Glasses which Melt at Low Temperatures to be Used for Coating Metals.

WALTER SCOTT, M.A. *Chemistry*

The Application of Rapidly Rotating Reductors in the Determination of Vanadic Acid (with F. A. Gooch). Am. Jour. Sci., 46:1918. The Application of Rotating Reductors in the Determination of Iron. Jour. Ind. Eng. Chem., 11:1919. The Application of Rotating Reductor of Zinc in the Determination of Molybdenum. Jour. Ind. Eng. Chem., 1920.

LILY BELL SEFTON, M.A. *Chemistry*

The Estimation of Nitrates and Nitrites in Battery Acid. Tech. Papers of the Bur. of Standards No. 149, 1920. The Standardization of Well-water in the Granville Vicinity. Bul. Sci. Assoc. Denison Univ., 1911. The Determination of Impurities in Battery Acids (ready for publication).

ERNEST LINCOLN STOVER, B.S. *Botany*

A Study of the Relative Evaporation Rates in Various Plant Habitats in the Vicinity of Columbus, Ohio. Taxonomy and Distribution of the Grasses.

EDWARD LAWRENCE WICKLIFF, B.S. *Zoology and Entomology*

Food of the Young Small-mouth Bass. Thesis for M.S.

FACULTY

LESLIE LAWSON BIGELOW, A.B., M.D. *Medicine*

Lympho-sarcoma of the Mesentery, Ann. Surgery, Jan. 1920. The After-care of Surgical Patients, Ohio State Med. Jour. Tuberculous Peritonitis, ibid. Post-operative Thrombophlebitis, ibid. Differential Diagnosis of Fracture Into and Near Joints, Columbus Acad. Med.

EMERY ROE HAYHURST, A.B., M.D., Ph.D. *Medicine*

Report of an Expedition to Cripple Creek and Pike's Peak to Study the Effect of Altitude on the Blood (with G. T. Kemp). Amer. Jour. Phys. 10, no. 6, Feb. 1904. Critical Examination of 100 Painters for

Evidences of Lead Poisoning. Amer. Jour. Med. Sci., 147:788-804, 1914. The Prevalence of Occupational Factors in Disease, and Suggestions for Their Elimination. Jour. Amer. Med. Assoc. Dec. 1914. Health Hazards and Mortality Statistics of Soft Coal Mining in Illinois and Ohio. Jour. Ind. Hygiene, Nov. 1919; and others.

HOWARD MACK, Ph.D. *Chemistry*

Water Content of Coal and Some Ideas on the Origin of Coal. Amer. Jour. Sci., 1916. Water Content of Colloidal Substances, Amer. Jour. Sci., 1918. Synthesis of Ethers. Jour. Amer. Chem. Soc., 39:712.

ANDREWS ROGERS, Ph.B., M.D. *Medicine*

The Conduction of Labor in Occiput Posterior cases, Ohio State Med. Jour., 1914-15. Blood Pressure in Fatigue of Labor. Relation of Toxemias of Pregnancy to Metabolism and to Internal Secretions. Thymic Trachio-stenosis in the New Born. Endocarditis as an Influencing Factor in Puerperal Morbidity.

NON-RESIDENT

MELVIN GUY MELLON, Ph.D. *Chemistry*

Further Studies on a Lead Standard Cell. Jour. Amer. Chem. Soc., 42, April 1920. A Study of a Possible Method for the Differentiation of Raw from Pasteurized Milk. Jour. Ind. and Eng. Chem., 9, 1917.

ALUMNI

FRANK H. BLACKBURN, M.E. *Electrical Engineering*

A Study of the Problem of Flashing Carbon Filaments and the Development of Automatic Equipment to Treat These Filaments to a Definite Final Resistance. Development of a Gauging System for Glass Tubing.

JAMES PARK CALDERWOOD, M.E. *Mechanical Engineering*

Prevention of Pounding in Kerosene Engines. Bull. Penn. State College Eng. Exp. Station, no. 10. Purchasing of Coal by Specification and Methods of Sampling Coal, ibid. Bul. No. 14. The Effect of Velocity and Humidity of Air on Heat Transmission Through Building Materials. Ibid. Bul. No. 16. Empirical Method for Determining the Ultimate from the Proximate Analysis of Coal. ibid. Bul. No. 21.

WALTER M. DANN, M.E. *Electrical Engineering*

Mechanical Stresses in Reactance Coils. Elec. Jour., 11, 1914. Polarity of Transformers. Ibid. Vol. 13, 1916.

FRANK M. DORSEY, C.E. *Chemical Engineering*

Researches on Charcoal for Lamps and Gas Masks. Researches on Development of Poison Gases.

CLARE OLIN EWING, B.S., M.S. *Pharmacognosy*

Sensitivity of some Commercial Litmus Papers (with Arno Viehoever). So-Called Syrian Alkanet, Macrotomia Cephalotes, D.C. (with J. F. Clevenger). Jour. Amer. Pharmaceutical Assoc. July, 1918. Partial Analysis of 330 American Crude Drugs (with Clevenger), Ibid. Dec. 1919, Jan. 1920; and others.

WILLIAM GEORGE GAESSLER, B.S. *Pharmacy*

The Sudan-Grass Hay (with A. C. McCandlish). Jour. Ag. Research. An Iodine Addition Product of Cumarin (with A. W. Dox). Jour. Amer. Chem. Soc. Water Requirements for Milk Production (with A. C. McCandlish). Jour. Dairy Science. The Pasteurization of Cream for Butter Making (with M. Mortensen and W. H. Cooper). Bull. 156, Ag. Exp. Sta., Iowa State College.

EDWARD FREDERICK GEHRKENS, E.E. *Electrical Engineering*

Improvements in Transformers, Compensators and Regulators.

FRANK HAAS, C.E., E.M. *Ceramic Engineering*

Coal Analysis, W. Va. Geol. Survey. Treating Dust in Coal Mines. Eng. and Min. Jour. Mine Gases. Colliery Eng. Jour.

CHARLES POTTER HOOVER, B.A. *Chemistry*

Electrolytic Production of Sodium Hypochlorite. Jour. Amer. Pub. Health Assoc., 1, 114. Methods and Equipment for Applying Lime Water at the Columbus Water Purification Works. Eng. News, 72:682-4, 1914. Manufacture of Sulphate of Alumina at Columbus Water Softening and Purification Works. Jour. Amer. Assoc., 43-448-9, 1915. Recovery of Spent Lime at Columbus Water Softening and Purification Works. Jour. Amer. Water Works Assoc., 3:889-93, 1916.

CLARENCE ROSCOE KING, B.S. *Chemical Engineering*

The Improvement in Methods for the Manufacture of Abrasive Materials Used in the Grinding Wheel Industry.

HARRY LEPPER KIRKER, B.S. *Electrical Engineering*

Important Work on the Electrification of Railways.

JOHN CROMWELL LINCOLN, M.E. *Electrical Engineering*

Inventor of the Lincoln Variable Speed Motor and of other Products Manufactured by the Lincoln Electric Company and the Lincoln Bonding Company. Lime Disturbances due to Starting Induction Motors. Trans. Amer. Inst. Elec. Eng., 34.

JESSE JOSEPH LINEBAUGH, M.E. *Electrical Engineering*

Inventor of the Method of Power Regenerator for Direct Current Electric Railways. Regenerator Electric Making. Gen. Elec. Rev., 19, 1916.

ZENO PAYNE METCALF, B.A. *Entomology*

The Wing Venation of the Jassidae. Ann. Entom. Soc. Amer., 6:103-115, 1913. The Wing Venation of the Cercopidae. Ann. Entom. Soc. Amer., 10:27-34, 1917. Biological Investigations of Sphenophorus collossus. Tech. Bull., no. 13, N. C. Exp. Sta., 1917. Lime as an Insecticide. Jour. Econ. Entomology, 10:74-78, 1917.

WILBUR EUGENE MOUGEY, M.E. *Electrical Engineering*

Inventor, Engineer with the Western Electric Company. The Company has taken out in his name three patents, Nos. 1,124,249, 1,277,025, and 1,271,824.

ESTELLE COLER RANEY, M.E. *Electrical Engineering*

Invention of an Automatic Breaker and Other Devices Connected with the Control of Electrical Circuit.

AUGUSTINE DAWSON SELBY, B.S. *Botany*

Germination of Seeds of Some Common Cultivated Plants after Prolonged Immersion in Liquid Air. Bul. Torrey Club, 28:675-679, 1901. The Prevention of Onion Smut. Bul. Ohio Ag. Exp. Sta., 131:47-51, 1902. A Rosette Disease of Potatoes Attributed to the Sterile Fungus, Rhizoctonia. Bul. Ohio Ag. Exp. Sta., 139:53-66, 1903. Studies in Etoilation. Bul. Torrey Club, 33:67-76, 1906. Grape Rots in Ohio. Bull. Ohio Ag. Exp. Sta., 123:85-94, 1901.

EDWARD HENRY TENNY, B.A., M.E. *Electrical Engineering*

Elected on Basis of Engineering Achievements.

FRANCIS EDMUND WYNNE, B.A., M.E. *Electrical Engineering*

Operation on the Norfolk and Western Railway. Amer. Inst. Elec. Eng. Economics in Railway Operations. Ibid. Selection of Correct Car Equipment. Elec. Jour. Locomative Weights. Ibid.

H. C. SAMPSON, *Secretary*

## THE MISSOURI CHAPTER

During the academic year 1919-1920 seven scientific and business meetings were held. The first two meetings were devoted to a discussion of the research work being done, time available for research, equipment for research, and research projects. Reports were made by all departments and these meetings proved to be among our most valuable of the year.

On October 21, 1919, the Society listened to an interesting talk by Dr. C. E. McClung as to the aims of the National Research Council.

The Society held a joint meeting with Alpha Zeta Pi on March 12 at which time Mr. S. W. Hamilton, special agent of the National Committee of Mental Hygiene, who is making a survey of Missouri institutions for the insane and feeble minded, addressed us on the subject of Care of the Insane in Missouri.

Our Circuit Public Lecturer for the year was Dr. W. A. Noyes of the Department of Chemistry of the University of Illinois. He gave us two very enjoyable lectures, the first on Foundations and Chemical Development and the second on Positive and Negative Valence. These lectures were held on March 26 and 27.

The first public meeting where active members presented papers was on March 18, 1920. The following program was given:

Dr. C. W. Greene, On the Physiological Changes in the Human Heart Rate and Blood Pressure as Experienced by Aviators.

Dr. P. F. Swindle, A New Theory of Association.

At this meeting the following associate members were elected. All were graduate students.

| | |
|---|---|
| Eldon Claude Bohrer | *Physiology* |
| Jesse Reeves Camp | *Chemistry* |
| Fred Oscar Coe | *Zoology* |
| Herbert F. Kriege | *Chemistry* |
| Mary Engleton Lear | *Chemistry* |
| Paul M. Morton | *Physiology* |
| Walter S. Ritchie | *Chemistry* |

The annual business meeting for the election of new active members and officers was on March 23, 1920. The following were elected to active membership in the society:

FACULTY

Alexander Cartwright Lanier, B.S. in E.E., M.E., M.EE.
*Professor Electrical Engineering*

Experimental Determination of Pole Face Losses. Proc. Am. Inst. Elec. Eng. Development of Motor-Generator Balancer Sets, with special reference to compounding and stability. Elec. Jour., 1912.

Frances Virginia Guthrie, A.B., B.S., M.A.
*Instructor in Pathology*

Modification of Tissue Oxidation in Vitro. Proc. Soc. Exp. Biol. and Med., 1910, 7:152. The Effects of Direct Application of Magnesium

Salts. *A.* To Motor and Sensory Nerves: *B.* To Cardio-Inhibitory Nerves. C. C. Guthrie, F. V. Guthrie and A. H. Ryan. Proc. Soc. Exp. Biol. Med., 1909, 7:39. The Effect of Asphyxia on the Pupil. Science n.s., 1910, 31:395. The Pigmentation of Nerve Cells. I. The Non-Fatty, Melanotic Pigment in the Dog and Rabbit produced by Chronic Depression. David H. Dolley and Frances V. Guthrie. Jour. Med. Research, 1918, 39:123. II. The Bipochrome a Plant Carotinoid Pigment. David H. Dolley and Frances V. Guthrie. Jour. Med. Research 1919, 40:295.

GRADUATES

FINIS OMER DUNCAN, B.S. *Mathematics*

Riemann Surfaces for Certain Non-analytic Transformations—thesis for M.A.

EUGENE LEE SETTLES, A.B. *Medicine*

The Effect of a High Fat Diet on the Size of Lmyphoid Organs—thesis for M.A.

HUGH POTEET MUIR, A.B. *Medicine*

The Venous System of the Twenty Millimeter Pig Embryo—thesis for M.A.

OLIVER HENRY GAEBLER, A.B. *Medicine*

The Bladder Epithelium in Contraction and Expansion—thesis for M.A.

WILLIAM DEAN COLLIER, A.B. *Medicine*

The Experimental Production of Functional Cell Hypertrophy—thesis for M.A.

The chapter held its annual initiation on April 21. This was followed immediately by a joint luncheon with Phi Beta Kappa. Dean F. F. Mumford of the College of Agriculture addressed the two societies on the Spirit of Research, and Dean Walter Miller of the Graduate School, on the Spirit of Letters and Philosophy. All members of both organizations desire the repetition of this joint luncheon.

W. A. TARR, *Secretary*

## ILLINOIS CHAPTER

Report of the Illinois Chapter of Sigma Xi for the year 1919-1920.

The Illinois Chapter closes a successful year. Eight meetings have been held, at seven of which scientific programs were presented.

A social hour was held immediately following each of these programs. The active membership has been about 170 and the associate membership 15.

The following is a summary of the programs for the year:

October 22. The International Union of Pure and Applied Chemistry, Professor E. W. Washburn. The International Astronomical Union, Professor Joel Stebbins.

November 19. Water Supplies for the American Troops in France, Professor Edward Bartow.

January 14. At the meeting of January 14 a large number of short papers were presented which were summaries of papers read before various scientific societies during the holiday recess.

February 18. Untechnical Discussion of the Changing Views as to Compounds and Elements, Atoms and Electrons, Matter and Energy, led by Professors Eric K. Rideal and Jakob Kunz.

March 17. Algae as Rock Builders, Professor C. F. Hottes.

April 14. Relation of the National Research Council to the Sigma Xi Society, Professor C. E. McClung, President of the National Society.

May 5. Election of officers and members.

May 19. Initiation of members. Presidential address, The Survival of the Unlike, by Professor W. Trelease.

Below is given the list of elections in the various classes with the basis for election in each case.

ACTIVE MEMBERS FROM THE FACULTY

VINCENT STEPHEN DAY, B.S. *Mechanical Engineering*

Emissivity of Heat from Various Surfaces, Bull. 117, Eng. Exp. Sta. Univ. of Ill.

WILLIAM ALBERT DUNKLEY, B.S. *State Geological Survey*

Influence of Quality of Gas and Other Factors on the Efficiencies of Gas Mantle-Lamps. Technologic Paper No. 110, U. S. Bur. of Stand., with R. S. McBride. The Manufacture of Retort Coal Gas in the Central States using Low-Sulfur Coals from Illinois, Indiana, and Western Kentucky. Bull. 21, Cooperative Mining Series, by Ill. State Geol. Survey, with W. W. Odell. Water-Gas Manufacture with Central District Bituminous Coals as Generator Fuel. Bull. 22, Cooperative Mining Series, with W. W. Odell. Also other publications.

EMRY G. HYATT, B.S. *Pharmacology*

Antidotes in Mercuric Chloride Poisoning. Jour. of Lab. and Clin. Med., 2, Aug. 1917. The Primary Depression and Secondary Rise in Blood Pressure Caused by Epinephrine. Jour. Pharmacol. Exp. Therap. 12, Sept. 1918. The Action of Alcohol on the Heart and Respiration. Jour. of Lab. and Clin. Med., 5, Oct. 1919.

WALTER WOLLEBEN KUSTERMANN, A.B., Ph.D. *Mathematics*

Uber Fouriersche Doppelreihen. Inaugural diss. Munich, (1913). Proof of Convergence. Bull. Amer. Math. Soc. (1914). Funktionen von besderaukter Schwaukung. Math. Annalen, (1916).

REXFORD NEWCOMB, B.S., A.M. *Architecture*

Franciscan Mission Architecture of Alta, California. Arch. Book Pub. Co. A Remnant of Spanish Architecture in Texas. Western Arch. (1919). A Completion of the Mission of San Antonio de Valero, Texas. Western Arch. (1919). The Architecture of the Spanish Renaissance in California. Also other publications.

WILLIAM FERDINAND PETERSON, B.S., M.D. *Pathology*

Studies in Ferment Action. Jour. Exp. Med. 1914 to 1916, No. 10-32. The Ferment-Antiferment Balance and its Relation to Therapeusis. Arch. Int. Med., 20, Oct. 1917. Serum Changes Following Protein "Shock" Therapy. Arch. Int. Med., 20, Nov. 1917. Factors in Resistance to Tuberculosis. Arch. Int. Med., 21, Jan. 1918. Also other publications.

WILLIAM HORACE RAYNER, B.S., C.E. *Civil Engineering*

Errors in the Use of the Steel Tape. Proc. Ill. Soc. Eng. and Surveyors (1916). Corrections for Sag in Long Steel Tapes. Eng. and Min. Jour., Aug. 1917. Socializing our Engineering Education. Bull. Soc. for Promotion of Eng. Edu. (1914). Bachelors of Science or Skill. Eng. Educ., Mar. 1919.

ERIC KEIGHTLEY RIDEAL, M.S., Ph.D., D.Sc. *Chemistry*

Das elektrochemische Verhalten des Urans und einiger Uranverbindungen. Inaug. Diss., Bonn, (1913). Biography, 66-68. (Rideal and Evans, U.V.) An electrochemical indicator for oxidizing agents. Analyst 38:353-63. The Corrosion and Rusting of Iron. Abst. in Surveyor 44: 848-49; also in C. A. 8:1083. Eng. Contrg. 40:735-737. Awarded gold medal. Electrometallurgy. (1918). (Rideal and Taylor, H. S.) Catalysis in Theory and Practice. (In press). Ozone. (In press).

EMMA LOUISE WARDELL *Home Economics*

The Colorimetric Estimation of Cholesterol in Blood. Myers and Wardell, J. Biol. Chem., 36:147. The Concentration of Urea in Human Blood. Kast and Wardell. Arch. Int. Med., 22:581. Effect of Ingestion of Coffee, Tea and Caffein on the Excretion of Uric Acid in Man. Mandel and Wardell. J.A.M.A., 68:1805.

ACTIVE MEMBERS FROM GRADUATE STUDENTS

MINER MANLEY AUSTIN, A.B., M.S. *Chemistry*

Potash in Illinois Shales—thesis for Ph.D.

DORTHA BESSIE BAILEY, A.B. *Chemistry*

Anti-Dimming Preparations for Gas Masks. Jour. Ind. and Eng. Chem., 77. Dec. 1919. The preparation of Synthetic Mydriatics—thesis for M.A.

CHARLES FRANCIS GREEN, A.B., A.M. *Mathematics*

On the Summability and Regions of Summability of a General Class of Series of the Form $\Sigma\, c_n\, g(x+n)$—thesis for Ph.D.

COLEMAN ROBERTS GRIFFITH, A.B. *Psychology*

A Possible Case of Instinctive Behavior in the White Rat. Sci., 50:166, 1919. The Behavior of White Rats in the Presence of Cats. Psychobiology, 2:19, 1920.

ADA ROBERTA HALL, B.A., M.A. *Zoology*

Some Experiments on the Resistance of Sea-urchin Eggs to Sulphurous Acid. Univ. Oregon Pub. Regeneration of Nerves in the Earthworm. Jour. of Morphology. (In press).

WALTER JOHN RICHARD HEINEKAMP, B.S. *Pharmacology*

Action of Adrenalin on the Heart. I. Action on the Turtle Heart. Jour. Pharm. Exp. Therap., 14, Sept. 1917. II. The Modification of he Action of Adrenalin. Jour. Pharm. Exp. Therap., 14:327, Dec. 1919. A Simple Method for the Preparation of a Spinal Animal. (with Hugh McGuigan, M.D.) Jour. of Lab. and Clin. Med., 4, May 1919. Recovery of Streptococcus Hemolyticus from Restaurant Tableware. Amer. Jour. of Pub. Health. (In press).

RALPH WILLIAM HUFFERD, A.M. *Chemistry*

The Application of Victor Meyer's Esterification Law to Neighboring Xylic Acid and its Reduction Derivatives—thesis for Ph.D.

WILLIAM HENRY HYSLOP, A.B., A.M. *Physics*

An Undamped Wave Method of Determining Dielectric Constants of Liquids. Phys. Rev., 15, 2nd Series, Mar. 1920. (With A. P. Carman)—thesis for Ph.D.

JOSE JISON MIRASOL, B.S., M.S. *Agronomy*

Aluminum as a Factor in Soil Acidity—thesis for Ph.D.

SAMUEL RUSSELL OFFUTT, B.S. *Civil Engineering*

Analysis of Statically Indeterminate Building Trusses by the Application of Maxwell's Theorem of Reciprocal Displacements and the Development of Empirical Formulae for the Reactions and Moments—thesis for M.S.

WILLIAM LOUIS SCHWALBE, B.S. *Theoretical and Applied Mechanics*
The Determination of the Mobility of the Materials and Mixtures in Making Concrete—thesis for M.S.

LYNNE HERMANN ULICH, A.B. *Chemistry*
The Use of Oxalyl Chloride and Bromide for Producing Acid Chlorides, Acid Bromides or Acid Anhydrides. Jour. Am. Chem. Soc., 42:599, 1920. The Condensation of Aliphatic and Aromatic Halides with Aliphatic Aldehydes—thesis for Ph.D.

ROSCOE WOODS, A.B., A.M. *Mathematics*
Elliptic Modular Functions Associated with the Elliptic Norm Curve $E^r$—thesis for Ph.D.

SADOA YOSHIDA, D.Sc. *Zoology*
On the Development of Ascaris Lumbricoides. Jour. Parasit., 5, March 1919. On the Resistant Power of Ascarid Eggs in their Development. Tokyo Med. Weekly Jour. (Japanese), May, 1919. On the Migrating Course of Ascarid Larvae in the Body of the Host. Jour. Parasit., 5, Sept. 1919. Also other papers.

ASSOCIATE MEMBERS FROM GRADUATES

BEULAH ARMSTRONG, A.M. *Mathematics*

FOSTER FLOYD ELLIOTT, B.S. *Dairy Husbandry*
A Study of the Semi-official Records of Holstein-Fresian Cows—thesis for M.S.

EDWIN COULTHARD FRITTS, B.S. *Physics*
Experiments on Osmotic-Electric Electromotive Forces. Phys. Rev., 15, 2nd Series, Feb. 1920. (With A. P. Carman).

LLOYD BLINN HAM, A.B. *Physics*
Notes on Black Nickel Finishes. The Monthly Rev., Published by Amer. Electroplaters Soc., 6, July, 1919. (With G. B. Hogaboom).

BRUCE MAGILL HARRISON, A.B., AM. *Zoology*

AMOS HENRY HERSH, A.B., A.M. *Zoology*
The Development of the Vitreous Body in the Eye of the Chick—thesis for A.M.

DUNCAN CHARTERIS HETHERINGTON, A.B. *Zoology*
Studies on Protospirura muris (Gmelin 1790)—thesis for A.M.

CHARLES FRANCIS HILL, A.B., A.M. *Physics*
A Determination of the Absorption of Gases by Different Kinds of Glass—thesis for Ph.D.

CLEMENCE WILLIAM HIPPARD, B.S. *Mining Engineering*

Storage of Coal. Eng. Exp. Sta. Circular (in press). In collaboration with Professor H. H. Stoek.

RALPH CRAIG HUFFER, A.B. *Mathematics*

On the Methods of Determining Complex Roots of Algebraic Equations—thesis for A.M.

WALTER RAYMOND KIRNER, B.S. *Chemistry*

The Preparation of Synthetic Quinoline Compounds Similar to Quinine—thesis for M.A.

CLAUDE JEROME LAPP, A.B. *Physics*

A Graphic Study of Sound Waves Emitted by Singing Tubes—thesis for M.A.

JACOBUS STEPHANUS MARAIS *Agronomy*

ROY ANDREW NELSON, B.S. *Physics*

Experimental Methods of Determihing Thermal Conductivity of Poor Conductors—thesis for M.S.

ELEANOR FRANCES SEILER, B.A., M.A. *Physics*

Color Sensitiveness of Photo-Electric Cells—thesis for Ph.D.

WILLIAM PERCIVAL SNYDER, B.S. *Botany*

The Effect of External Conditions on the Development of the Common Bean—thesis for M.A.

FLOYD KENYON THAYER, A.B. *Chemistry*

The Introduction of a Carboxyethyl Group into the Molecule of Certain Synthetic Local Anesthetics—thesis for M.A.

LYELL JAY THOMAS, B.S. *Zoology*

The Male of Trichosomoides crassicauda (Bellingham 1843)—thesis for A.M.

ALFRED CHARLES VOGELE, B.S. *Botany*

The Effect of Ultra-Violet Light on Oat Seedlings—thesis for M.A.

FRANK GUSTAV WAHLEN, B.S., M.S. *Mathematics*

Thermal Properties of Ammonia—thesis for Ph.D.

MARGARET WALKER *Mathematics*

Brownlee's Graduation Formulae Applied to U. S. Life Tables—thesis for M.A.

ELLIS RUSSELL WEAVER, B.S. *Zoology*

The Morphology of Heterakis spumosa (Schneider 1866)—thesis for M.S.

ASSOCIATE MEMBERS FROM UNDERGRADUATES

HENRY ERNES BRAUER *Chemical Engineering*

Relation of Properties and Structure of Tungsten and Molybdenum High Speed Steels to Heat Treatment—thesis for B.S.

MARGARET JEANNETTE BUSEY *Chemistry*

Primary Decomposition Products Occurring at Successive Temperatures in the Carbonization of Lignite Coal—thesis for B.S.

OSCAR ALLEN CHERRY *Chemistry*

The Effect of Oxygen on the Coking of Coal—thesis for B.S.

IRVING ALSON DENISON *Agronomy*

MORRIS EDWARD DREYFUS *Chemical Engineering*

Spiral Compounds—thesis for B.S.

JAMES EDWARD HANSEN *Chemistry*

Primary Decomposition Products Occurring at Successive Temperature in the Carbonization of Eastern High Volatile Coal—thesis for B.S.

ARTHUR WELLESLEY HAYFORD *Chemical Engineering*

The Examination of Pressure Still Gasolene for the Purpose of (a) Detecting the presence of isoprene, (b) to reduce the unsaturated content—thesis for B.S.

ROSELLE KARRER *Zoology*

WILLIAM HOWARD SANDERS *Physics*

LOUIS SPIEGLER *Chemistry*

Hydrogeneration of Cymene—thesis for B.S.

ROGER GREENLEAF STEVENS *Chemical Engineering*

Observations on the Rare Earths; The Purification of Yttrium and Erbium—thesis for B.S.

FRED GUY STRAUB *Chemical Engineering*

Primary Decomposition Products Occurring at Successive Temperatures in the Carbonization of Pocahontas Coal—thesis for B.S.

CHARLOTTE BALDWIN WARD *Chemistry*

E. H. WILLIAMS, *Secretary*

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List corrected up to September 1, 1920.

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Seventh (Philadelphia) Convention. 1904. Pamphlet. 15 pp.
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Later conventions are reported in the QUARTERLY.

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